

29. (NEW) An apparatus according to claim 28, wherein said plurality of surface protrusions are coupled to the outer surface of said tapered shell.

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REMARKS

Initially, Applicant has cancelled all claims 1-16 and added new claims 17-29. No new matter has been added.

Applicant believes that the new claims and the following comments overcome the rejections set forth in the November

10 10, 2003 Office Action.

I. **THE INVENTION**

Generally, the present invention relates to the field of cable splicing in high-voltage environments.

15 Importantly, high-voltage devices require splices which must maintain proper voltage grading, electrical insulation and water tightness. The present invention provides an apparatus for aiding in the preparation of an effective cable splice. In particular, the apparatus expands the
20 inside diameter of a cable adapter while providing and maintaining uniform distribution of lubrication between an adapter wedge and joint components in high-voltage cable splices. The invention further provides a time-efficient,

easier method of cable splicing that requires few installation components.

The present invention comprises a uniquely tapered adapter wedge, or mandrel, further comprising a bore and
5 surface protrusions or aberrations, which in the preferred embodiment consist of longitudinally placed ribs. The ribs protrude outward from the center of the adapter wedge, and are dispersed longitudinally around the circumference of the outside surface. Furthermore, the present invention
10 discloses that any surface protrusions (i.e., portions raised or recessed) including ribs of varying dimensions and shapes, raised ribs, recessed ribs, recessed dimples, convex protrusions, concave depressions, etc. may be used.

Importantly, an object of the present invention is to
15 expand the inner diameter of a cable adapter while providing uniform distribution of lubrication to aid in cable splicing. Thus, the present invention discloses an easier method for the insertion of a prepared cable member into a cable adapter by providing a uniquely designed
20 adapter wedge. The adapter wedge assists in allowing the cable member to effectively mate with the cable adapter to create an interference fit. The use of lubrication within the inner diameter of the cable adapter and on the wedge has important advantages. The lubrication provides a void-

free interface between the interior surfaces of the assembly, which may further provide a resilient barrier against the ingress of moisture into the spliced region.

Further, using an effective lubricating substance

5 eliminates the need to further expand the inner diameter of the cable adapter which requires additional complex tools.

The system of the present invention effectively expands the cable adapter to allow for the insertion of the cable member, while providing a uniform application of
10 useful lubrication throughout an entire inner portion of a premolded expandable product (i.e., between the inner surface of an expandable cable adapter and the outer surface of a cable member). The desired lubrication is maintained within the splice before and after expansion of
15 the cable adapter. This is accomplished by placing longitudinal ribs, recessed ribs, recessed dimples, convex protrusions or other similar surface protrusion designs on the outside surface of the adapter wedge. In addition, the invention effectively provides a simplified apparatus for
20 high voltage splicing, requiring minimal additional tools, which allows a cable adapter to be placed over a cable member with limited force for assembly. This results in the reduction of excessive assembly time onsite and the elimination of excessive stress on the cable components.

Upon the exit of the adapter wedge from the cable splice configuration, the cable member remains positioned inside the lubricated cable adapter which retracts to form a tight fit between the cable member and the cable adapter.

- 5 With the lubrication in place, the cable adapter may then be slid back and forth over the cable member to allow for easy positioning adjustments.

Typically, adapter wedges known in the art tend to remove and limit the usefulness of lubrication by creating
10 excessive deposits of the lubrication on the wedge during cable splicing. The mechanical configuration and the designs of the prior art adapter wedges do not provide an adequate means for the prevention of the removal of the lubricant during assembly and expansion of the cable
15 adapter. Most, if not all of the lubricating substance is often removed from the cable members and cable adapters upon the placement of the wedge. Improper lubrication may lead to the use of excessive force when affixing the adapter over the cable, which may, in turn, lead to
20 improper installation. This results in additional labor costs and time as well as the failure of the splice.

Thus, the system of the present invention provides a novel method of cable splicing which, unlike the prior art, incorporates a useful design for expanding the inner

surface of a cable adapter while retaining sufficient lubrication on the interior surface of the cable adapter. This unique design allows for an easier, more efficient and less costly cable splicing process and ensures a proper interference fit between the cable member and cable adapter.

II. THE EXAMINER'S REJECTIONS

The Examiner rejected claims 1-7, 10 and 14-16 under 35 U.S.C. 103(a) as being unpatentable over Cole U.S.

Patent No. 1,857,436 ("Cole"). According to the Examiner, Cole teaches a cable splice for wire cables which has a socket of conical shape and an interior tapered toward the end in which the cable is to be inserted and a hollow wedge having an interior substantially cylindrical. Further, Cole discloses that the wedge has separable portions. The Examiner then contended that Cole teaches that the tapered shell has ribs. The Examiner noted:

"Inasmuch as Cole teaches that the tapered shell has ribs. (Note the extreme left portion of the Figure 3; also note Figure 4) It would have been obvious if indeed one does not construe these Figures as having ribs therein to provide ribs inasmuch as the ribs would act to further assist the apparatus to perform its intended function."

The Examiner also argued that the use of lubrication is a "mere design choice since there is neither a specific purpose elucidated nor a specific problem which is solved."

The Examiner further rejected claims 1-6, and 10 under
5 35 U.S.C. 103(a) as being unpatentable over Lyashenko et al. U.S. Patent No. 3,633,265 ("Lyashenko"). The Examiner stated that Lyashenko teaches a tapered socket which has ribs about the outer surface of the tapered shell.
Further, the Examiner contended that it would have been
10 obvious "to provide ribs if indeed Lyashenko et al do not teach such ribs to assist the apparatus to perform its intended function."

III. AMENDMENTS TO THE CLAIMS

15 Applicant has cancelled all claims 1-16 in favor of new claims 17-29 which more clearly define the present invention and comply with the Examiner's election restriction. Specifically, the claims now incorporate the limitation that the apparatus comprises a system for
20 retaining lubrication. The claims recite that the tapered shell contains "a plurality of surface protrusions" to indicate that portions of the surface are raised or depressed relative to other portions. New independent claims 17, 26 and 28 have been added for the Examiner's

review. The dependent claims have been added to further define the invention and to incorporate the limitations of the previous dependent claims, while eliminating redundancy.

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IV. THE EXAMINER'S REJECTIONS SHOULD BE WITHDRAWN

The Examiner rejected claims 1-7, 10 and 14-16 under 35 U.S.C. § 103(a) as being unpatentable over Cole in view of knowledge commonly held in the art. Applicant
10 respectfully submits that Cole discloses a cable splice especially designed for use in connection with cables of the kind in which there is employed a series of wires arranged spirally in cylindrical form, and an outer series of wires arranged spirally in an opposite direction. Cole
15 teaches the use of a wedge as part of the cable splice that is inserted into the cable in a rotary manner. Cole describes:

20 "Then the wedge is driven into the cable, and while being thus driven the strands of wire **18** will then accurately enter the respective grooves **14** on the interior of the wedge, and the wires and grooves will thereby form screw threads so that the wedge will be partly rotated during its entering movement."

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The wedge disclosed in Cole is a permanent part of the cable splice invention rather than an assembly aid. In contrast, the present invention discloses a cable splicing

method which uses an adapter wedge to aid in the cable splicing process. The adapter wedge assists in the insertion of a cable member into a cable adapter by expanding the inner diameter of the cable adapter without removing the lubrication. Generally, the adapter wedge is then removed from the assembly to finish the splicing procedure. Applicant respectfully submits that the Examiner's reliance on Cole is mistaken. The invention of Cole is a cable splice rather than a method for assisting in the cable splicing process.

Furthermore, a key feature of the present invention is the uniform distribution of lubrication to aid in the cable splicing process. Applicant has added independent claims 17, 26 and 28 which better define the invention and further recite the limitation of "retaining lubricant" in the preamble of the claims. In addition, this limitation has been added as a claim element to the independent claims. The invention discloses a means for retaining lubrication within the rib-type formations of the disclosed adapter wedge. As discussed *supra*, lubrication eliminates the need to stretch the cable adapter with unnecessary force and stress. Instead, the cable adapter is expanded just enough to fit the adapter wedge therethrough. This guarantees that the cable adapter will retract to its normal state

upon removal of the wedge. Lubrication allows for easy positioning and adjusting upon removal. It also assists in securing a tight fit between the cable adapter and the cable member creating a barrier which thwarts the ingress of moisture. Further, lubrication eliminates the need for additional on-site tools, making the splicing process easier and more efficient.

The surface protrusions (e.g., longitudinally placed ribs) on the exterior surface of the adapter wedge ensure that the lubrication is uniformly distributed. In addition, this structure guarantees that the lubrication does not collect on the front of the adapter wedge or is not lost from the inside of the premolded expandable product as the adapter wedge is guided therethrough. Applicant respectfully submits that the use of ribs or similar surface protrusions for this purpose would not be obvious in the cable splice of Cole. Furthermore, Cole clearly discloses that the exterior surface of the wedge must be smooth for proper assembly of the splice.

"Due to the fact that the outer surface of the wedge is smooth, the wedge can readily rotate inside of the layer of wires **19** which are spirally arranged in an opposite direction."

Applicant respectfully submits that the use of rib-type structures or protrusions in Cole would actually hinder the operation of the system.

In conclusion, applicant respectfully asserts that the
5 Examiner's reliance on Cole is misplaced. Cole does not disclose the use of ribs or other surface aberrations on the exterior surface of the wedge as believed by the Examiner. The purpose of the surface protrusions associated with the present invention is to aid in the
10 cable splicing process by providing uniform distribution of lubrication between cable members and cable adapters while expanding the cable adapter. There would be no obvious use for ribs or protrusions as described by the present invention in the system of Cole as Cole does not even
15 mention the use of lubrication. In fact, lubricating the exterior surface of the wedge would not be useful in the system of Cole.

The Examiner further rejected claims 1-6, and 10 under
35 U.S.C. § 103(a) as being unpatentable over Lyashenko et
20 al. U.S. Patent No. 3,633,265 ("Lyashenko"). Lyashenko is directed to a method for securing wire ropes and in particular spiral-lay wire ropes. The objective of the invention is to ensure the structural integrity of the rope under alternating loads at the point of socketing.

Applicant respectfully submits that the invention disclosed by Lyashenko does not apply to high-voltage cables.

Furthermore, the use of lubricant in the invention of Lyashenko serves a different purpose from that of the applicant's invention. Lyashenko discloses:

10 "The material of the rings 13, 14, 15, 16, 17 and
of the soft gasket 8 starts to flow, filling the
gaps, compressing the lubricant and forcing out
the air pockets from between the wires, thereby
forming grooves 31 (FIG. 6) on the inner surface
of the rings 13, 14, 15, 16 17 said grooves
intersecting the outer ones. During the further
squeezing, the material of the rings 13, 14, 15,
16 17 said grooves intersecting the outer ones.
15 During the further squeezing, the material of the
rings 13, 14, 15, 16, 17 forces out the lubricant
and fills the gaps between the wires (FIG. 7)
thus cold filling the end of the rope 1 with
metal in the socket 7. The other end of the rope
20 1 is secured in the socket 9 in the same manner."

Applicant respectfully submits that the rib-like structures disclosed in Lyashenko are not used to uniformly distribute lubrication to provide for a more efficient
25 cable splice, as taught by applicant's present invention.
Further, the invention of Lyashenko involves the removal of lubrication from between the wires. In contrast, the objective of the applicant's invention is the retention of lubrication to aid in the formation of a splice.
30 Furthermore, as stated in the patent, the use of ribs to retain lubrication would contradict the purpose disclosed in Lyashenko. Thus, applicant respectfully believes that

the Examiner's reliance on Lyashenko is misplaced. While
Lyashenko discloses both rib-like structures and a
partially lubricated outer shell, the invention does not
disclose a particular method and apparatus for forming
5 high-voltage cable splices as taught by the present
invention.

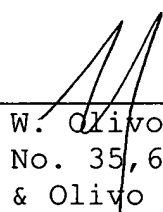
CONCLUSION

In view of the foregoing amendments and remarks,
10 Applicant respectfully submits that all pending claims
represent a patentable contribution to the art and the
application is in condition for allowance. No new matter
has been added. Early and favorable action is accordingly
solicited.

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Respectfully submitted,

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